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13. ABSTRACT *(Maximum 200 words)*

Experiments were performed on quadratic soliton generation in Type I, non-critically phase-matched $KNbO_3$. Using a very sensitive detector array and image enhancement protocols, the first picture of a quadratic soliton on was obtained. Further experiments were performed on KTP with the goal of demonstrating the spontaneous generation of quadratic solitons via down conversion from noise.

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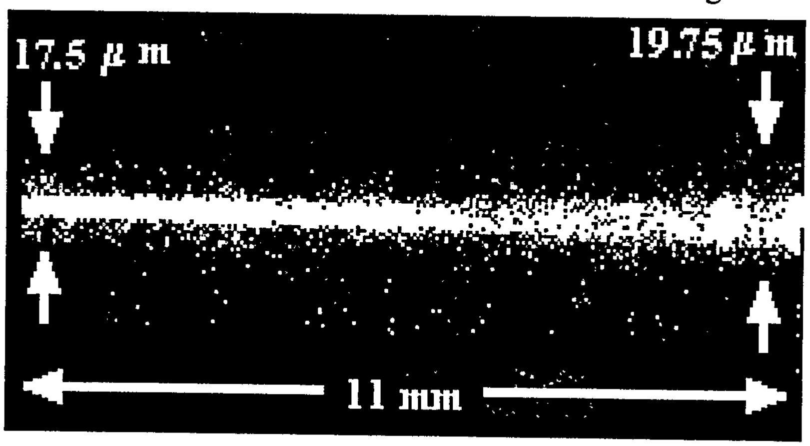
Project Title: Cascaded Spatial Solitons: Network Routing

The student supported by this AASERT, Russell Fuerst, has made considerable progress this year towards a PhD. His course requirements are finished and his Dissertation Proposal was accepted for a PhD program. His work was upgraded to an invited paper at IQEC'98 and OSA Annual Meeting. He attended a NATO Summer School in Corsica France in August of last. He is expected to graduate no later than the spring semester of 1999.

The ultimate goal of this program is to use spatial solitons as reconfigurable interconnects for guiding signals between multiple input and output ports. The immediate goal was to understand some of the basic properties of spatial solitons in quadratic media. The concept is to use steerable spatial solitons for guiding signal beams for implementation to NxN reconfigurable interconnects.
His research progress in the last 10 months can be summarized as follows:

(1) Preliminary experiments were performed on quadratic soliton generation in Type I, non-critically phase-matched $KNbO_3$. Because the effective nonlinearity is 17 pm/V, a proliferation of solitons was observed at input intensities of 100s of MW/cm^2. Using a very sensitive detector array and image enhancement protocols, Russell was able to get the first picture of a quadratic soliton, shown on the left. Light is input on the right hand side and the non-diffracting nature of the beam is clear for the sample which was 5 diffraction lengths long. However, the bandwidth of the OPO/OPG system is too broad for investigation of soliton properties. The OPO has been rebuilt to narrow the linewidth and experiments will continue with this material.



(2) Further experiments were performed on KTP with the goal of demonstrating the spontaneous generation of quadratic solitons via down conversion from noise. A strong input excitation at 532 nm was used, and the crystal was tilted away from the orientation needed for efficient second harmonic generation with a 1064 nm input. This tilt changes the phase-matching condition from degeneracy to non-degeneracy for the frequencies generated by down conversion. As a result, the generated quadratic soliton contained three different frequencies, the 532 nm component and two components equally split about 1064 nm by about 10 nm. Since this is a Type II crystal, the two fundamental components are also orthogonally polarized. At the time we did this experiment we believed that it was the first example of a quadratic soliton generated from noise in a single pass OPG/OPA configuration *Unfortunately, a similar experiment was just published in Phys. Rev. Lett by Trapani et al.*